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THE NATIONAL GEOGRAPHIC MAGAZINE

THE REPUBLIC OF PANAMA

BY HON. WM. H. BURR, OF THE ISTHMIAN CANAL COMMISSION

THE youngest of the American republics has almost the oldest history. The Caribbean coast line of Colombia and of Panama was one of the earliest localities visited by the old Spanish navigators. One of them, Alonzo de Ojeda, visited a number of places along this coast in 1499 and 1501, while Columbus visited Porto Bello, 25 miles northeast of Colon, and other places in 1502, during his last voyage. From those dates onward all this portion of the Spanish main was constantly visited, explored, and apportioned among Spanish officials. Many expeditions of discovery were made inland, until all that northwesterly portion of South America which has so long been known as Venezuela, Colombia, and Ecuador was completely explored and a fair knowledge of its resources, mineral and otherwise, obtained.

One of the most important incidents in these exploring expeditions occurred when Vasco Nunez de Balboa, governor of the province in Darien, first set out southward from his capital, Santa Maria de la Antigua, prompted by what the Indians had told him, and, from an elevation on the divide north of the Gulf of San Miguel, discovered the Pacific Ocean on the 25th day of September, 1513. Many of the earliest historical events of the Republic of Panama are associated with this intrepid explorer. He was on the Isthmus but a short period, but his restless energy was ever prompting him to new enterprises of exploration and aggrandizement of territory for his home government. His remarkable career was cut short in 1517 by his execution at Acla, on the Caribbean shore of the Gulf of Darien, by a jealous governor of the province, who feared that Balboa's fruitful enterprises might give him sufficient *éclat* to make him the head of the new Spanish territory in place of himself.

The Spanish discoverers found all this country, like others of South and Central America, peopled with large numbers of Indians.

The territory constituting the present Republic of Panama, as well as the northwesterly portion and west coast of South America, was carefully scoured in search of the precious metals of which fabulous stories were related by the natives, many of which were justified by subsequent results. Balboa himself visited

the Pearl Islands in the Bay of Panama. These operations of the early Spaniards involved frequent crossing of the Isthmus, and even before the death of Balboa it became evident that the most practicable line of transportation was that which is now known as the Panama route.

Many attempts were made to find other practicable routes across the Isthmus between the Atrato River, emptying into the Gulf of Darien, and the Chagres River, emptying into the Caribbean Sea eight miles west of Colon; but the advantages of the Panama route were promptly recognized by the Spaniards.

A territory, consisting largely of the present Panama, Colombia, and Venezuela, was formed into the province of Tierra-firma. It was the governor of this province, Pedro Arias de Avila, who, to strengthen his authority, brought charges against Balboa, and after a form of trial executed him at Acla. By the middle of the sixteenth century large numbers of Spaniards had migrated to this country and created flourishing centers of trade. About this time, in order to secure a more suitable government for his colony, the Spanish emperor created the presidency of New Granada, which was subsequently raised to the rank of a viceroyalty in 1718, then including not only Colombia and Venezuela but Ecuador also. The territory of the Isthmus formed the northwestern arm of this Spanish appanage.

Like that of most Spanish colonies, the government of the country was corrupt, being administered largely for the benefit of the favored few in authority; but on the whole the country flourished, the population increased, and trade extended along the lines of production of the country.

THE REVOLUTION AGAINST SPANISH AUTHORITY

The course of affairs in the viceroyalty continued without much change until 1811. Many features of the Spanish rule had long borne heavily upon the people and aroused such feeling that at last they broke out into an insurrection against the home government. A continuous war against the Spanish forces sent to put down the insurrection continued until 1824, when Spanish authority disappeared. Meantime the Venezuelan patriot, Simon Bolivar, born in the city of Caracas in 1783, made his way into prominence in national affairs, and in 1819 completed a union of the three divisions of the country into the first Republic of Colombia. This republic was short lived. Venezuela withdrew in 1829 and Ecuador in 1830. The creation of the Republic of New Granada followed in 1831, but its constitution was not formed until 1832. Under it the territory was divided into eighteen provinces. The president of the new republic held office four years. The course of affairs was much disturbed, and a civil war broke out after one or two presidential terms, and did not close until 1841. In 1840 the Province of Cartagena seceded from the new republic, and immediately thereafter the neighboring provinces of Panama and Veragua took the same step. This was the first period of independence of the Isthmus of Panama. The revolting states were soon reunited under a constitution reformed in 1843. The Republic of New Granada enjoyed little tranquillity, being subject to domestic disturbances of greater or less magnitude almost continuously, but various measures signifying general advancement in civilization were adopted from time to time. Among those was one by which slavery was entirely abolished in 1852.

An important alteration of the constitution took place in 1853, under which the provinces were merely federated into the republic, each being granted the right to assume its independence at any time. This right under

A Wedding at Colon

the constitution was asserted by Antioquia and Panama in 1856 and 1857, this being the second independence of the Province of Panama. Stormy times followed these national upheavals, and the independence of the provinces was not long undisturbed. A congress at Bogota established a republic under the name of the United States of Colombia in 1861, adopting a new federal constitution for the purpose of including all the territory hitherto held by the Republic of Colombia, including the Isthmus of Panama. The opposite party, however, victorious in the western portion of the country, declined to acknowledge the authority at Bogota. Internal disturbances of all degrees,

including the assassination of leaders and bloody battles, constituted the program until 1862, when the opposing parties came to terms to a sufficient extent to permit the appointment of a provincial government and the drawing up of a constitution. At this time another attempt, not successful, was made to reëstablish the former republic of the three countries—Venezuela, Colombia, and Ecuador; but under the constitution adopted May 8, 1863, the Republic of Colombia was erected, and it has endured to the present time. Insurrections and internal disorganizations prevailed for a number of years, and the history of the Republic has been accentuated by frequent revolutions, many of which have taken place in Panama.

EXTENT OF THE PRESENT REPUBLIC

This brings us to the consideration of the Republic of Panama as it now stands, having declared its independence on November 3, 1903. The Republic of Panama is identical in territorial limits with the department of Panama of the Republic of Colombia. This department extended from Costa Rica on the west to a line drawn first nearly due south from Cape Tiburon at the southern limit of the Gulf of Darién, then southwesterly to a point on the Pacific coast a short distance southeast of Punta Cocalito. This last or eastern limit of the department of Panama is almost entirely along the divide between the Atrato River and the watershed draining into the Gulf of San Miguel.

The Republic of Panama lies between the parallels of 7° 15′ and 9° north latitude, and also between 77° 15′ and 82° 30′ longitude west from Greenwich. Approximately speaking, therefore, its extreme length east and west is about three hundred and fifty miles, and its extreme width north and south one hundred and twenty miles. Its population is not well determined, but it probably does not extend three hundred thousand. This population is largely composed of people of Spanish descent, but there are also large numbers of negroes, who have come chiefly from Jamaica during the constructing work conducted by the old Panama Company. A few Chinamen have also found their way to the Isthmus and become permanent residents. The native Indians are also occasionally seen on the zone of population between Panama and Colon. These races have been mingled in all conceivable proportions, so that the features or racial characteristics of one or more or even all of these various nationalities may be traced in the face of a single individual. Some of the old Spanish families have still retained the purity of their blood and are among the prominent people of the Isthmus. Its entire area is about 31,600 square miles, or about the area of the State of Indiana.

The Cordillera forming the main mountain ridge extending from South to North America and constituting the continental divide runs through the entire length of the Republic of Panama, in the eastern portion the divide being much nearer the Caribbean Sea than the Pacific Ocean, while in the western portion its location is more nearly central. The low notch or saddle in the Cordillera near the city of Panama, with a summit elevation about 300 feet above sea level, the lowest throughout the Central American Isthmus except at Nicaragua, affords the railroad location built upon nearly fifty years ago and the recommended route for the isthmian ship canal.

Not less than one-half of the entire territory of the Republic is mountainous and covered with luxuriant tropical vegetation, including heavy forest trees, some of which are among the highly valuable woods. These forests are practically trackless. Tribes of Indians, not in large numbers, live along the Caribbean coast between Panama and Darien,

and also on the southern slopes. Some of these Indians preserve jealously their isolation, and have never acknowledged the sovereignty of any government.

THE PANAMA RAILROAD

The most prominent feature of the Republic of Panama is the Panama Railroad and the partially constructed canal, with the adjacent strip of territory, including the cities and towns, with their aggregated business or industrial centers, along the line from Colon to Panama.

This railroad, a single-track line of five feet gauge, was built nearly fifty years ago. It is but forty-nine miles long, and it is conducted practically as an American railroad corporation, although it is owned by the new Panama Canal Company. The principal offices of the company are in the city of New York. This company does not confine itself wholly to railroad business, but owns and conducts the line of steamers running between the ports of New York and Colon under the name of the Panama Railroad-Steamship Company.

The railroad forms a line of land transportation to which converges marine commerce from many widely separated ports of the world. On the Pacific side steamship lines plying up and down the west coast of South America, and the Pacific mail steamships touching along the North and Central America coast from San Francisco southward, together with other ships approaching from the Pacific Ocean, have made Panama their terminal port for many years. The port of Colon has an equally extensive ocean shipping business, with not less than nine or ten steamship lines from Spain, France, England, Germany, Italy, and the United States, making it either a terminal port or port of call. In addition to these ocean steamship lines there is a little coasting trade of a local character on both sides of the Isthmus carried on in small sailing vessels.

The Panama Railroad has always been a prominent transportation line, along which currents of commerce and streams of passenger traffic, fed by the steamship lines on the two oceans, have continuously flowed. Latterly a considerable banana trade has also sprung up along the railroad line.

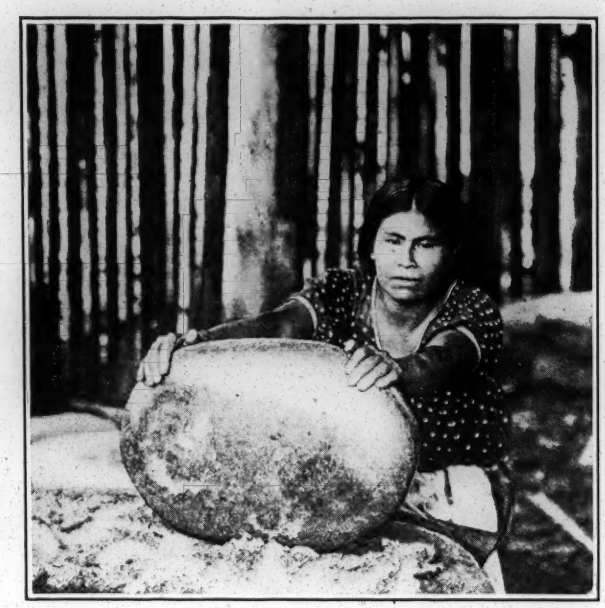
THE RELATION OF THE ISTHMUS TO THE REST OF THE WORLD

The location of the Isthmus is markedly central to that portion of the through commerce of the world which would be served by the Panama Canal. It is practically a half-way station between the ports of eastern Asia, Australia, and the islands between and the ports of Europe. It is believed that the opening of the canal will create a highly stimulating influence upon the trade between the west coast of South America and the ports of the United States—a business which has hitherto been developed chiefly with foreign ports. The geographical relation of the Republic of Panama to some of the principal ports of the world is shown by the following statement of the distances in nautical miles to be sailed by steam vessels on the respective trips indicated:

	Miles
From Panama to San Francisco	3,277
From Panama to Honolulu	4,665
From Panama to Yokohama	8,065
From Panama to Shanghai	8,985
From Colon to New York	1,981
From Colon to Liverpool	4,720
From Colon to New Orleans	1,380

THE RESOURCES OF THE REPUBLIC

The mineral resources of the Republic of Panama are practically undeveloped, although it is known that there are considerable deposits of coal of fair quality—perhaps of excellent quality—not far from the railroad and canal zone. The precious metals are found in small quantities at many points, with indications of greater value; but these resources, like many others of the new republic,



Grinding Grain

are in such an undeveloped stage that no definite statement can be made as to their potential value.

The agricultural resources of the country are greater than ordinarily supposed. There is excellent grazing land near Colon, along the Panama Railroad, and within a few miles of the city of Panama. Further west, in the Chiriqui district, and on the Pacific side of that portion of the Isthmus, there are extensive stretches of country well adapted to agricultural purposes, both for grazing and for the raising of all those tropical products which grow in such luxuriance throughout the fertile portions of Central America and the Isthmus. Fine grades of stock in substantial numbers are already found on some portions of the Isthmus, and dairy farming is already conducted in the vicinity of Panama.

Large stretches of native forests of valuable timber, such as mahogany, both light and dark, and other similar woods are found throughout the Republic, but are yet practically undeveloped. Such valuable tropical products as cacao, bananas of all kinds, sugar cane, indigo, cotton, tobacco, vanilla, corn, rice, and other similar products grow in abundance, and conditions of systematic industry only are needed to develop them into sources of great wealth to the country. Under the encouraging influences of a stable government, where life and property are respected, the natural resources of the Republic of Panama will be productive of an amount of wealth which, if stated in a quantitative way, would now be incredible, in view of the crude and depressed conditions of industry which have prevailed from the beginnings of its history to the present time.

COMMUNICATION

There are practically no roads found in the Republic except those of a crude and ill-kept kind near to the cities or towns along the line of the Panama Railroad Company between Colon and Panama. The only marked exception to this statement is the old so-called Royal road built between Cruces, on the upper Chagres, to Panama, a distance of about 17 miles. This old road, formerly a crude paved way, was traveled by passengers crossing the Isthmus before the construction of the Panama Railroad. This traffic found its way up the Chagres River to the small native town of Cruces, now containing a few scores of people, and then passed overland from that point either on foot or horseback, or by such crude vehicles as the country afforded, to Panama. It was by this route that many people went to California during the gold excitement of 1849 and the years immedi-

ately following. This road has been abandoned for many years, as has the ancient road from Portobello to Panama.

The greater portion of the territory of the Republic is of small elevation, with many large marshes along the seacoast. Even the mountainous portions east and southeast of the railroad, forming the Darien country, are not high, probably in no case exceeding an elevation of 2,800 feet. The arable land on either side of the Isthmus is mostly ground of low elevation.

THE CLIMATE

The climate of the Isthmus is thoroughly tropical in character, but it is by no means entitled to the bad name which is so frequently given to it. In speaking of this climate, all business and social activity in the Republic of Panama is so centered in the vicinity of the railroad line, which is also practically the proposed canal route, that observations as to climatic or other conditions apply strictly to this vicinity, although they are practically the same for other parts of the Republic.

At Panama the Isthmus is scarcely more than forty miles wide. The proximity of the two oceans necessarily affects the climate in a marked manner. The continental divide at this location is low, rising to an elevation but little more than three hundred feet above mean sea level. Winds therefore blow across the entire Isthmus almost unobstructed. Under the tropical sun the evaporation from the two oceans is rapid, and the consequence is an atmosphere highly charged with aqueous vapor at nearly all times. The high temperature of the tropical climate is therefore accentuated with great humidity, which is enervating to a marked degree to those who have been bred in a temperate climate.

The temperature at Colon, on the Caribbean side of the Isthmus, not often rises above 90° Fahr., although it occasionally reaches 98° or even a little higher, as in December, 1885 (98°.2), and January and March, 1886 (98°.2), the latter year being an unusually hot one. The mean of the maximum monthly temperature that year was 95°.2 Fahr. The usual maximum monthly temperature ranges from about 85° Fahr. to about 91° or 92° Fahr. The minimum monthly temperature usually ranges from about 60° Fahr. to about 75° Fahr., the mean minimum monthly temperature being but little under 70° Fahr. The mean temperature throughout the year is not far from 80° Fahr. The interior points of the Isthmus, such as Gamboa and Obispo, about half way across the Isthmus on the railroad line, generally experience maximum temperatures perhaps two or three degrees higher than at Colon, and minimum temperatures perhaps three or four degrees lower than at that point. On the Pacific side the temperature may run a degree or two higher than at Colon. For all ordinary purposes it may be stated that there is no sensible difference in temperature on the two sides of the Isthmus, nor in other climatic conditions except the rainfall, which differs sensibly. On the high ground at Culebra, where the canal and railroad lines cut the continental divide, and where the elevation is from two hundred to three hundred feet above sea level, the air is cooler and dryer than at either seacoast. These figures show that the ruling temperatures on the Isthmus are not so high as those shown by the hottest weather of a New York or Washington summer; but the temperatures, such as they are on the Isthmus, continue without material abatement.

The low latitude of the Isthmus of Panama, the farthest point north lying in latitude 9°, brings the sun at the zenith twice during the year, once at noon on April 13 on its journey northward, and the second time at noon on August 29 on its return southward

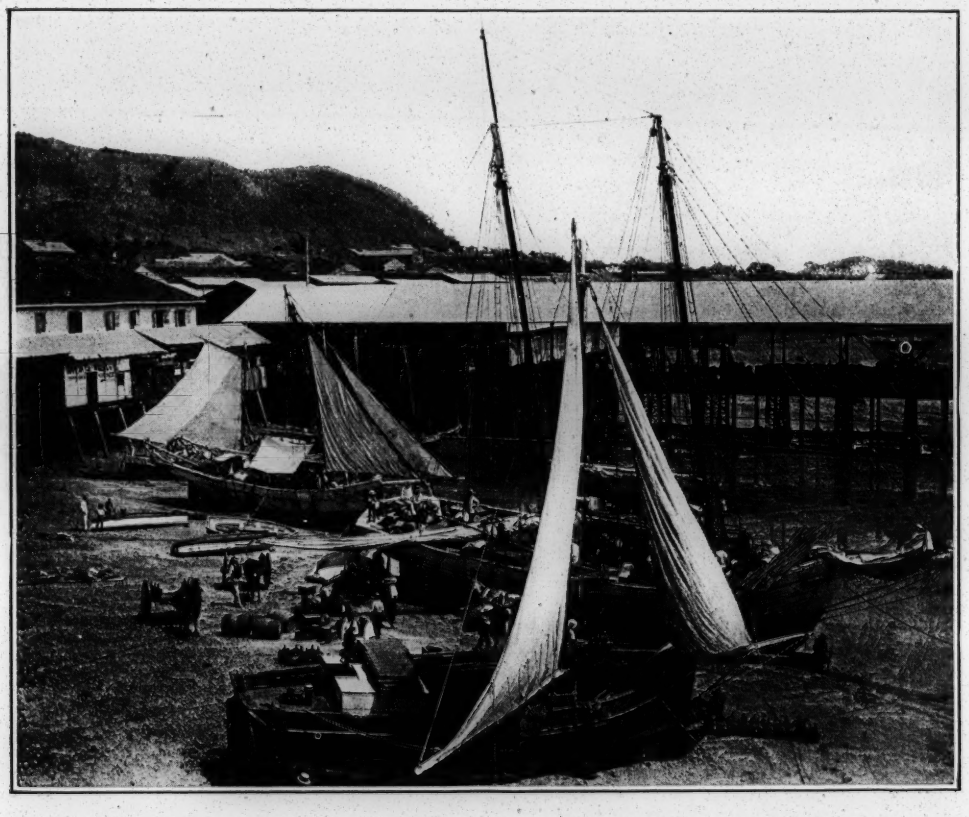
toward the winter solstice. At the summer solstice its elevation above the north horizon is 75° 41′ and 57° 24′ above the south horizon at the winter solstice. These conditions introduce an approach to uniformity in the temperature of the varying seasons, as they also produce opposite prevailing winds in different portions of the year. As the direct rays of the sun tend to cause the hot air to rise vertically under it during those portions of the year when the sun is north of the zenith, the prevailing winds are southerly or southwesterly, but when it is south of the zenith the same causes make the prevailing winds from north or northeasterly. It is in this portion of the year when at rare intervals the northers blow into the harbor of Colon with such severity as to require ships found in it to put to sea for their safety.

The year on the Isthmus is divided into the dry season and the wet season. The dry season covers the four months of January, February, March, and April, during which little or no rain falls. The wet season is composed of the remaining eight months of the year, the wettest portions being usually in May and in October. The rainfall on the Caribbean side—*i. e.*, at Colon—is considerably greater than either in the interior or on the Pacific side, its annual amount usually ranging from about 85 to nearly 155 inches, with an average of about 125 to 130 inches. In the interior, as at Gamboa or Bas Obispo, the annual precipitation varies ordinarily from about 75 to nearly 140 inches, with an average of 90 to 95 inches. The total precipitation at Panama, however, may vary from about 45 to about 85 inches per annum, with an average of about 66 to 67 inches. As the average annual precipitation in New York or Washington may vary approximately from 40 to 50 inches, it is seen that the wet season in the Republic of Panama exhibits relatively high rainfall, although not more than about one-half of that which occurs at Greytown, in Nicaragua.

During the wet months there are some phenomenal downpours, with the effect of turning rivers into torrents, and this is particularly the case with the Chagres River, the principal river of the Republic, which empties into the Caribbean Sea about 8 miles west of Colon. Passing up this river from its mouth, its general course lies southeast for a distance of nearly 30 miles to Obispo. Still passing up stream, its course at this point turns sharply to the northeast. From Obispo for a distance of about 23 miles down stream the course of the Panama Railroad and the line of the proposed canal follow the Chagres River to the low lands adjoining the Caribbean coast. In the other direction, however, both the railroad and the canal leave the river at Obispo and cut through the continental divide toward Panama, the Panama end of the canal being about 20 miles from Obispo.

THE VARIOUS PROJECTS FOR A SHIP CANAL

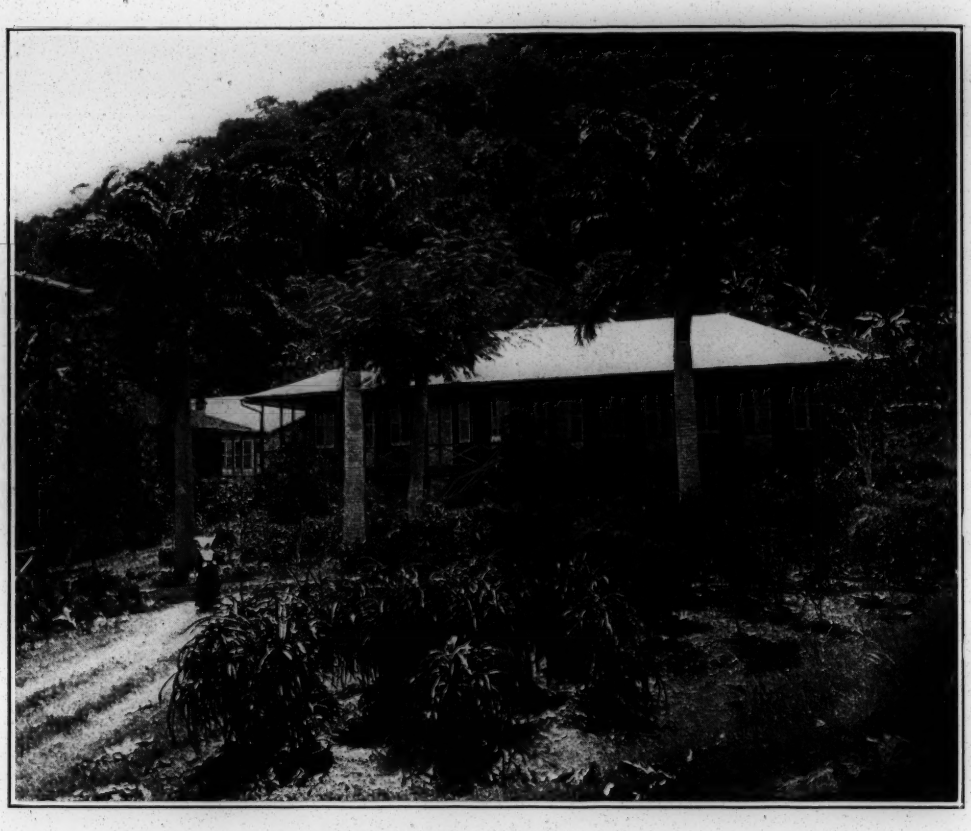
At the present time the greatest interest centering on the Republic of Panama, aside from the remarkable unanimity with which the people of the Isthmus as a unit declared and secured their independence through a single, effective but bloodless effort, is that which attaches to the proposed ship canal connecting the two oceans practically along the line of the Panama Railroad. The project of an Isthmian ship canal is almost as old as the discovery of the Isthmus, for it is nearly 400 years ago that the Spaniards themselves seriously discussed this enterprise. As early as 1520 the Spanish monarch, Charles V, directed a survey to be made for the purpose of determining the feasibility of an isthmian ship canal. From that time until this the project of a ship canal across the Isthmus has been actively dis-



Low Tide in the Harbor of Panama; the range of tide at Panama is 20 feet, and at Colon only one foot

cussed, although as a result of that early survey the Spanish governor declared "that such a work was impracticable, and that no king, however powerful he might be, was capable of forming a junction of the two seas or of furnishing the means of carrying out such an undertaking." The followers of the Spanish governor were less easily discouraged than he.

The ship-canal enterprise gathered advocates from one century to another, until, during the nineteenth century and the first years of the twentieth, many careful surveys of possible routes across the Isthmus were made. The principal of those lying in the Republic of Panama, beginning with the most easterly, are the Caledonia route, the San Blas route, and the Panama route. The Caledonia route has at times attracted much attention on account of the highly colored but absolutely false accounts rendered of it by one or two early explorers. The northern extremity of this route, at Caledonia Bay, is about one hundred and sixty-five miles east of Colon and crosses the Isthmus in the main in a southwesterly direction. The surveys of the Isthmian Canal Commission showed that the elevation of the divide at this point and the heavy work to be done along its line were far too great to permit its feasibility being considered in comparison with that of the Panama route. The San Blas route,



One of the Hospital Buildings on the Hill Back of Panama

the Caribbean end of which is on the Gulf of San Blas, is about sixty miles east of Colon. This route has the distinguishing characteristic of being located on probably the shortest line between the tide waters of the two oceans on the Isthmus, this distance being scarcely thirty miles. The short length of this line has secured for it a number of earnest advocates. It also was subject to survey by the engineering parties of the Isthmian Commission. The elevation of the divide at this crossing is so great as to necessitate the consideration of a ship tunnel from five to seven miles long, the canal being planned as a sea-level waterway. The great cost of a canal on this line and the hazards attending such a construction as a ship tunnel rendered this route, like the Caledonia line, neither practicable nor feasible, compared with the Panama route.

Many surveys and examinations have been made at different crossings of the Central American isthmus between Tehuantepec, in Mexico, and the eastern limit of the Republic of Panama. As earnest and as enthusiastic as the supporters of other routes have been, the most complete and exact surveys and estimates have shown that the Panama route embodies the greatest number of advantages of any line ever considered for a ship canal between the two oceans. It is a tribute to the sagacity and good

judgment of the old Spanish explorers that they also settled upon practically this route as the most feasible and practicable for the same purpose.

The proposed Panama line, favorably reported upon by the Isthmian Canal Commission and now adopted as the basis of the treaty being negotiated between the United States and the Republic of Panama, begins at Colon and extends in a southeasterly direction to a point on the Bay of Panama near the city of that name, and has a total length of 49.07 miles between the six-fathom curves in the two oceans. At the present time the city of Colon has a population of probably about 3,000 people, while the city of Panama has a population of perhaps 25,000 people. The population scattered along the line of the railroad may add ten to fifteen thousand more, making a total of perhaps forty to forty-five thousand people in the 10-mile strip of territory between the two oceans within which the railroad is found and the canal will be built.

THE PLAN OF DE LESSEPS

This canal route is that which was adopted at the International Scientific Congress convened in Paris in May, 1879, under the auspices of Ferdinand de Lesseps, the concession for the canal having been obtained from the Republic of Colombia in the preceding year by Lieut. L. N. B. Wyse, a French naval officer. This congress not only selected the Panama route, but also decided that the waterway to be constructed should be a sea-level canal. A company entitled "Compagnie Universelle du Canal Interocéanique," and commonly known as the Old Panama Canal Company, was immediately organized to construct the work. After various efforts it financed the enterprise and began work, which was prosecuted until May 15, 1889, when the company went into bankruptcy, and its effects were put into the hands of a liquidator, an officer of the French court corresponding closely to the American receiver.

Prior to the bankruptcy of the old company the project for a sea-level canal was temporarily abandoned in the hope that the funds available might be sufficient for the construction of a lock canal. After various vicissitudes the new Panama Canal Company was organized on the 20th of October, 1894 Work was resumed on the canal immediately thereafter, and has been continued until the present time, the force employed, however, being small. The old company raised by the sale of stocks and bonds not far from $246,000,000, and it has been stated that the number of persons holding the securities was over two hundred thousand.

When the concession for building the Panama Railroad was secured from the Colombian Government, control of all available transportation routes across the Isthmus in the territory of the present Republic of Panama was covered by it. The construction of the ship canal by the old Panama Canal Company was therefore subject to the rights conveyed in the Panama Railroad concession. In order to control this feature of the situation, therefore the old Panama Company purchased nearly the entire stock of the railroad company, which thus became a part of the assets of the new Panama Canal Company.

THE RECOMMENDATIONS OF THE ISTHMIAN COMMISSION

When the Isthmian Canal Commission made its first visit of investigation of the canal routes four years ago, it found a large amount of excavation and other work done along the line of the canal, as well as a large amount of land, buildings, structures, and many plans and papers, all constituting a part of the property of the new Panama Canal Company. All this property was situated on

the Isthmus except a mass of plans and papers in the office of the canal company at Paris. The Commission in its report, under date of November 16, 1901, recommended, in case of selection of the Panama route, payment of $40,000,000 to the new Panama Canal Company for all its property, rights, and concessions connected with the unfinished canal. That offer, as made by the United States Government, has since been accepted by the French company.

The Isthmian Canal Commission adopted the French line for its estimates, but made some material changes in the plans for the work. The canal as planned by the Commission is a lock canal, its typical or standard section for firm earth having a bottom width of 150 feet, a minimum depth of water of 35 feet, and a top width of 269 feet. This section is suitably modified for harbor sections, for sections in soft ground, for sections in rock and in lakes and wherever required by unusual conditions. These adopted sections would afford ample waterway for the greatest ships afloat at the present time, as required by the law creating the Commission.

The locks for this canal are great masonry constructions, having a usable length of 740 feet with a clear width of 84 feet, more than large enough to accommodate any vessel now afloat or planned to be built.

Beginning at the 6-fathom curve in the harbor of Colon, the canal is planned to be excavated for a distance of 7 miles through the low, marshy grounds in that vicinity to Gatun, where the line meets the Chagres River. From that point to Bohio, about 17 miles from Colon, a little east of south from the point of starting, the canal would be excavated generally along the marshy lowlands through which the Chagres River flows in that vicinity, cutting the course of that river four or five times. This 17-mile section of the canal is a sea-level section, but at Bohio is found a comparatively narrow place in the valley of the Chagres River with rock outcroppings on one side and at which a dam may be built. At this point it was the purpose of the French company also to build a dam, but the Isthmian Canal Commission provisionally located its dam at a site nearly half a mile downstream from that of the French dam, and proposes to build it materially higher.

THE GREAT DAM AT BOHIO

This dam would retain behind it the waters of the Chagres River at an elevation varying from 85 feet to 90 or 92 feet above mean sea level, thus forming what has been called Lake Bohio. It would back up the water of the Chagres River for a distance of about 20 miles, through about 14 of which the course of the canal would be laid. Lake Bohio would constitute the summit level of the canal, and would be reached by two great masonry locks built together, *i. e.*, in series near one end of the dam at Bohio, the lift of each one of these two locks being 45 feet as a maximum. These locks would be built as twin structures, so that if an accident should happen to one side the other side would still be available for use, and thus save the operation of the canal from being broken. A great ledge of rock affords an excellent site for the construction of these locks.

The building of this great dam at Bohio, with its top nearly 100 feet above the water in the river in its normal condition, is one of the great works of the entire canal construction. As the safety and operation of the canal would depend entirely upon the stability of this dam, the Commission recommended a plan of construction by which a masonry core wall 30 feet thick at the bottom and 8 feet at the top would be built up from the rock beneath the bed of the river to the top of the dam, thus efficiently preventing all leakage of water through the

A Market Scene in Panama

porous sand and gravel, of which large portions of the substrata beneath the river bed are composed.

As the top of this dam would have an elevation of 100 feet above the sea, and as the highest water in Lake Bohio would be 8 feet lower than that elevation, no water would ever overflow this dam, but the surplus of flood waters of the Chagres River would be discharged over a masonry spillway about 3 miles from the dam. The spillway weir would be of masonry and about 2,000 feet long. Its location is in a notch or depression in the ridge between the headwaters of a small tributary of the Chagres called the Gigante and the valley of the Chagres River. The crest of this 2,000-foot-long overflow would be 85 feet above sea level. It is estimated that with the greatest flood possible in the Chagres River the depth of water on the overflow weir would not be greater than 7 feet. During a great flood, therefore, the river would discharge into this lake, and its waters would accumulate there until deep enough to run over the masonry spillway. With the flood in a rising stage, the amount flowing over the spillway would increase

up to the greatest flood height, after which the rate of discharge over the spillway would decrease. This regulation of the Chagres floods, therefore, takes care of itself. It requires no attention. After discharging over the spillway, the flood waters would flow through an artificial channel down into the Chagres River beyond any of the canal works and where no damage would be done.

About 10 miles up the Chagres from Obispo at a point called Alhajuela there is an excellent site for a dam. It has been proposed to build at this Alhajuela site a great masonry dam for the purpose of impounding flood waters of the Chagres River to the extent of the storage capacity behind the dam, and so reduce the flood effects in Lake Bohio. This storage reservoir would also act as a source of feed water for the canal should the traffic on it in the future become so large as to require this additional supply.

THE CULEBRA CUT

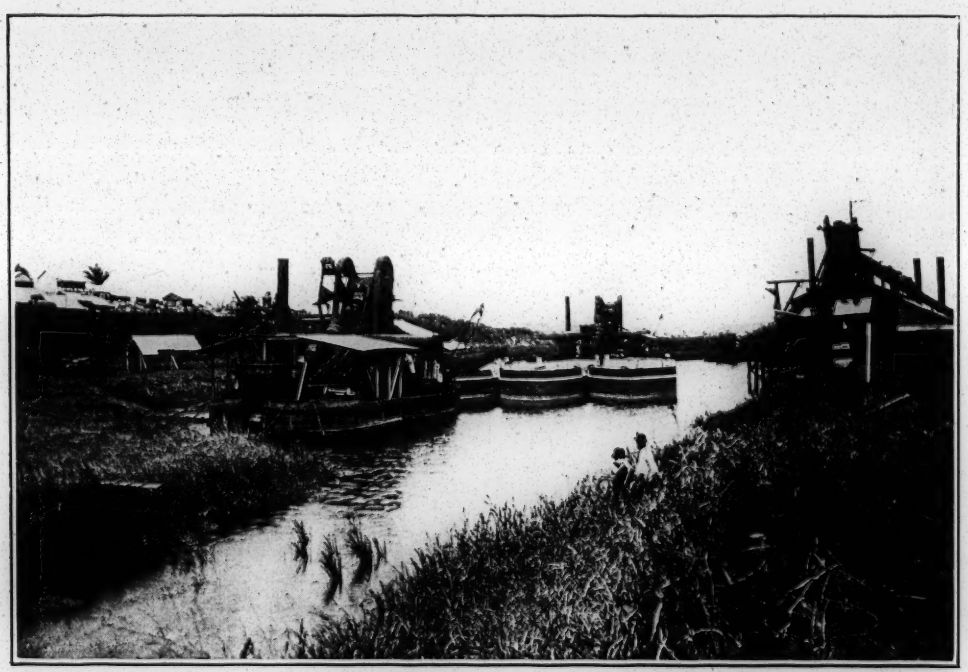
From Obispo, 30 miles from Colon, the canal line runs toward the southeast through the continental divide in a direct course toward Panama, and for nearly 7 miles from Obispo a great cut has to be made through the high ground forming that divide. For a distance of about 5 miles from Obispo this is known as the Emperador Cut, beyond which lies a mile and a half known as the Culebra Cut. The greatest depth of this cut at Culebra is about 250 feet, and the amount of material to be removed in this stretch of 7 miles of canal excavation is about 43,000,000 cubic yards. It is the greatest single feature of the entire canal construction.

The summit or Bohio Lake level ends at a point called Pedro Miguel, about 1½ miles southeasterly of the Culebra Cut and 38 miles from Colon, where is located a flight of two locks arranged in twin plan like the others, each one of the pair having a lift varying from 27 to 31 feet, according to the varying height of water in Lake Bohio. By means of these two locks the water surface in the canal is brought down to an elevation about 28 feet above sea level. The last lock on the line is at a point called Miraflores, a little less than a mile and a half from the Pedro Miguel locks. From Miraflores to the end of the canal, at a point called La Boca on the Bay of Panama, is less than 5 miles, and this portion of the canal constitutes what may be called the Pacific section or level. The water of this Pacific section of the canal rises and falls coincidently with the tides in the Bay of Panama, and as the range of tide in that bay is about 20 feet, the Miraflores lock is largely a tidal lock. Its minimum lift, therefore, at high tide, is 18 feet, while the maximum lift at low tide is 38 feet. It is obvious from these tidal conditions that if the canal were constructed as a sea-level canal a tidal lock would be needed at or near its Pacific end. That part of the canal line between Miraflores and the Bay of Panama is located closely along the course of the Rio Grande, which is mainly a tidal river, its two principal tributaries above Miraflores being Rio Pedro Miguel and Rio Caimitillo, both being small and insignificant streams.

The length of canal between the shore lines is about 44 miles, although the length between the 6-fathom curves on the two sides of the Isthmus, as has already been stated, is 49 miles, 13 of which lie in the artificial Lake Bohio. The creation of Lake Bohio would necessitate the relocation and rebuilding of the railroad between Bohio and Obispo, throwing it back upon higher ground.

No canal with locks can be operated without provision for the water used in taking boats through the locks, for evaporation, for seepage, and for other purposes incident to maintenance and operation of the canal. At each lock-

age on the Panama canal a lock full of water, representing a volume nearly 750 feet long, 84 feet wide, and 45 feet deep, would be used in the Bohio locks and about two-thirds as much in the Pedro Miguel locks. This requires a large supply of water, which the Isthmian Commission computed for all purposes to be 1,070 cubic feet per second for an annual traffic of 10,000,000 tons passing through the canal. This water supply automatic control it has been changed from a sinister agent to a friendly power. Furthermore, while the average discharge of the Chagres River is nearly three times the quantity required for feeding the canal, there are times in the dry seasons when the discharge of the river is not more than two-thirds of the quantity required for that purpose. This deficiency is abundantly made up by the storage in Lake Bohio until the traffic



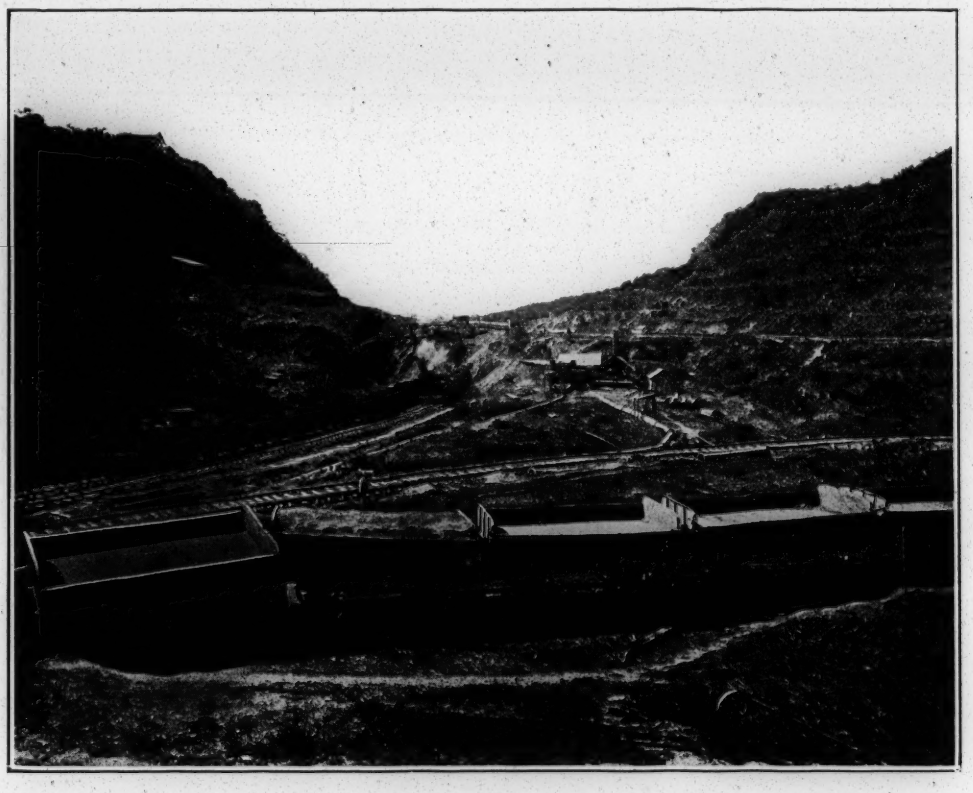
Cutting the Canal through Morasses, Chagres River Region

is afforded by the Chagres River, and without it or its equivalent the canal would not be possible.

In view of the complete system of self-control of the Chagres floods by the Gigante Spillway, the Chagres River, instead of being an insurmountable obstacle to the construction and maintenance of the canal, as has at times been apprehended, is actually a gracious feature of the canal environment, and by that exceeds 10,000,000 tons annually. At that time the storage in the Alhajuela reservoir will give an additional supply for an increase of traffic three or four times as great as the volume which can be accommodated by the storage in Lake Bohio.

ABOMINABLE SANITARY CONDITIONS

The sanitary conditions of the Isthmus are at the present time wretchedly bad.



The Culebra Cut

Neither Colon nor Panama has either a system of water supply or a sewer system. The water used in Panama for potable purposes is brought into the city in casks mounted on wheels and drawn by mules from some more or less polluted source outside of but near the city, or caught in cisterns from the rain water flowing from roofs during the wet season, or in some other crude and usually unsanitary way.

There are a few drains in the city of Panama, constructed immediately under the surface of the streets, with little or no regard to grades. The water or sewage and decaying matter collecting in the low portions of these drains and remaining there under the high temperature of the climate make them far worse than no drains at all. The lack of care and proper disposal of household and other refuse creates the most unsanitary conditions imaginable. These observations may be emphasized for the smaller towns and villages between Colon and Panama. As a consequence, yellow fever is probably always present, and at times assumes epidemic form. Malarial fevers and other similar diseases are also continually present under aggravated forms. These conditions, however, are completely remediable by means well known and available at the present time.

The entire Isthmus can be placed in a completely sanitary condition so that its healthfulness shall be assured by resorting to methods and means which have now become practically standard in the

sanitation of cities and towns. It is absolutely essential that water works, supplying potable and wholesome water, be established for the cities and larger towns, and concurrently therewith there must be established suitable sewer systems with rational and sanitary disposal of sewage. All these results are now perfectly practicable of attainment without unreasonable cost or material difficulty. It will be imperative, however, that sanitary regulations be created, enforced, and maintained with the rigor of military discipline. Under such reasonable sanitary conditions as it is entirely practicable to attain, and with proper quarantine regulations, there is no reason why the Isthmus may not be maintained entirely free of yellow fever or from other tropical epidemics.

COST OF THE CANAL

The United States Government has entered into a provisional agreement to purchase the entire property of every description and the rights of the new Panama Canal Company for the sum of $40,000,000. The cost of completing the Panama Canal under the plan of the Isthmian Canal Commission is estimated by that Commission at $144,233,358. The sum of these two amounts—$184,233,358—represents the total cost of the construction of the isthmian ship canal by this route, to which should be added such additional costs as are required to be incurred in securing the additional rights and concessions necessary to enable the United States Government to enter upon the Isthmus and begin the work.

The consummation of this great work is apparently close at hand. The creation of the Republic of Panama has solved the difficulties which had gathered about the negotiations of the requisite treaty, and it will probably be but a short time before this, the greatest engineering work of the world, will be undertaken and carried to completion. This achievement will not only create new lines of ocean commerce and stimulate some of the older lines into new life, but it will also bring the Atlantic and Pacific shores of the United States into much closer communication than before, thus strengthening those bonds of mutual interest and natural sympathy which lie at the foundation of best national life. In this part of the world's development the new Republic of Panama becomes the center of the material activities through which these great results will be accomplished, thus attaining the fruition of 400 years of effort. She is to be congratulated in marking her entrance among the nations of the earth by opening the way to the attainment of this world improvement and giving the work the impetus of her national sanction.

THE following table shows that the Panama Canal will bring New York much nearer to Hongkong and Yokohama, to the markets of the East, than Hamburg:

From	To	By way of Cape Horn.	By the Suez Canal.	By the Panama Canal.	Advantage in favor of Panama.
Hamburg	Hongkong	18,480	10,542	14,933	.....
New York	Hongkong	18,180	11,655	9,835	1,820
Hamburg	Yokohama	17,979	12,531	13,024	.....
New York	Yokohama	17,679	13,464	9,835	3,729
Hamburg	Melbourne	13,802	12,367	13,198	.....
New York	Melbourne	13,502	.....	10,427	2,863
Hamburg	San Francisco	15,140	.....	8,488	6,652
New York	San Francisco	14,840	.....	5,299	9,541

EIGHTH INTERNATIONAL GEOGRAPHIC CONGRESS, WASHINGTON, 1904.

THE Executive Committee of the Seventh International Geographical Congress, held in Berlin in 1899, having voted to convoke its next session in Washington, the National Geographic Society, as the organization responsible for the management of the sessions in the United States, will welcome the Eighth Congress and its friends in September, 1904.

Geographers and promoters of geography throughout the world, especially members of geographic societies and cognate institutions of scientific character, are cordially invited to assemble in Washington, D. C., September 8, 1904, for the first international meeting of geographers in the Western Hemisphere.

On the invitation of the National Geographic Society, the following societies join in welcoming the Congress, and undertake to coöperate toward its success, especially in so far as sessions to be held in their respective cities are concerned:

The American Geographical Society.
The Geographical Society of Philadelphia.
The Appalachian Mountain Club.
The Geographical Society of the Pacific.
The Sierra Club.
The American Alpine Club.
The Harvard Travellers' Club.
The Geographic Society of Baltimore.
The Geographic Society of Chicago.
The Geographical Society of California
The Mazamas.
The Peary Arctic Club.

SESSIONS AND EXCURSIONS

The Congress will convene in Washington on Thursday, September 8, in the new home of the National Geographic Society, and will hold sessions on the 9th and 10th, the latter under the auspices of the Geographic Society of Baltimore. Leaving Washington on the 12th, the Members, Associates, and guests of the Congress will be entertained during that day by the Geographical Society of Philadelphia, and on the 13th, 14th, and 15th by the American Geographical Society in New York, where scientific sessions will be held; on the 16th they will have the opportunity of visiting Niagara Falls (en route westward by special train) and on the 17th will be entertained by the Geographic Society of Chicago, and on Monday and Tuesday, September 19 and 20, they will be invited to participate in the International Congress of Arts and Science connected with the World's Fair in St. Louis. Arrangements will be made here for visiting exhibits of geographic interest. In case any considerable number of Members and Associates so desire, a Far-west excursion will be provided from St Louis to the City of Mexico, thence to Santa Fé; thence to the Grand Canyon of the Colorado, and on to San Francisco and the Golden Gate, where the western geographic societies will extend special hospitality; afterward returning by way of Mt Shasta and Portland and through the northern Rocky Mountains and the interior plains to the eastern ports.

If the membership and finances warrant, the foreign delegates will be the guests of the Congress from Washington to St Louis via Baltimore, Philadelphia, New York, Niagara Falls, and Chicago. On the general excursion special terms will be secured, reducing the aggregate cost of transportation, with sleeping-car accommodations and meals materially below the customary rates. It will be necessary to limit the number of persons on the Far-west excursion. It is planned also to secure special rates for transportation of foreign members from one or more European ports to New York, provided requisite

information as to the convenience and pleasure of such members be obtained in time. Final information on these points will be given in the preliminary program of June, 1904.

MEMBERSHIP

Members of the Congress will be entitled to participate in all sessions and excursions, and to attend all social meetings in honor of the Congress; they will also (whether in attendance or not) receive the publications of the Congress, including the daily program and the final volume of proceedings.

Membership may be acquired on payment of $5 (25 francs, 1 pound, or 20 marks) to the committee of arrangements. Persons not members of such societies may acquire membership by a similar payment and election by the presidency. Ladies and minors accompanying members may be registered as associates on payment of $2.50 (12½ francs, or 10 shillings, or 10 marks); they shall enjoy all privileges of members except the rights of voting and of receiving publications.

Geographers and their friends desirous of attending the Congress or receiving its publications are requested to signify their intention at the earliest practicable date in order that subsequent announcements may be sent them without delay, and that requisite arrangements for transportation may be effected. On receipt of subscriptions, Members' and Associates' tickets will be mailed to the subscribers. The privileges of the Congress, including the excursions and the social gatherings, can be extended only to holders of tickets.

It is earnestly hoped that the Congress of 1904 may be an assemblage of geographic and cognate institutions no less than of individual geographers; and to this end a special invitation is extended to such organizations to participate in the Congress through delegates, on the basis of one for each 100 members up to the maximum of 10.

PUBLICATIONS

The publications of the Congress will be sent free to all institutions registered. No charge will be made for the registration of institutions, though the Delegates will be expected to subscribe as Members; and in order that the list of affiliated institutions (to be issued in a later announcement) may be worthy of full confidence, the committee of arrangements reserve the right to withhold the name of any institution pending action by the presidency. It is especially desired that the geographic societies of the Western Hemisphere may utilize the opportunity affordedby this Congress for establishing closer relations with those of the Old World, and to facilitate this Spanish will be recognized as one of the languages of the Congress, with French, English, German, and Italian, in accordance with previous usage; and communications before the Congress may be written in any one (or more) of these languages.

Institutions not strictly geographic in character, libraries, universities, academies of science, and scientific societies are especially invited to subscribe as members in order to receive the publications of the Congress as issued.

SUBJECTS FOR DISCUSSION

The subjects for treatment and discussion in the Congress may be classified as follows:

1. Physical Geography, including Geomorphology, Meteorology, Hydrology, etc.
2. Mathematical Geography, including Geodesy and Geophysics.
3. Biogeography, including Botany and Zoology in their geographic aspects.
4. Anthropogeography, including Ethnology.
5. Descriptive Geography, including Explorations and Surveys.

6. Geographic Technology, including Cartography, Bibliography, etc.

7. Commercial and Industrial Geography.

8. History of Geography.

9. Geographic Education.

A special opportunity will be afforded for the discussion of methods of surveying and map-making, and for the comparison of these methods as pursued in other countries with the work of the great federal and state surveys maintained in this country.

Members and delegates desirous of presenting communications before the Congress, or wishing to propose subjects for discussion, are requested to signify their wishes at the earliest practicable date, in order that the titles or subjects may be incorporated in a preliminary program to be issued in June, 1904. The time required for presenting communications should be stated; otherwise twelve minutes will be allotted. It is anticipated that not more than twenty minutes can be allotted for any communication, unless the Presidency decide to extend the time by reason of the general interest or importance of the subject. The Presidency, with the complete organization of the Congress (including delegates), will be announced in the preliminary program of June, 1904.

All papers or abstracts designed for presentation before the Congress, and all proposals and applications affecting the Congress, will be submitted to a Program Committee, who shall decide whether the same are appropriate for incorporation in the announcements, though the decisions of this committee shall be subject to revision by the Presidency after the Congress convenes.

Any proposal affecting the organization of the Congress or the program for the Washington session must be received in writing not later than May 1, 1904. Communications designed to be printed in connection with the Congress must be received not later than June 1, and any abstracts of communications (not exceeding 300 words in length) to be printed in the general program to be published at the beginning of the session must be received not later than August 1, 1904. Daily programs will be issued during the sessions.

All correspondence relating to the Congress and all remittances should be addressed to the Eighth International Geographic Congress, Hubbard Memorial Building, Washington, D. C.

THE PRESIDENCY

The Presidency up to the time of the assembling of the Congress will consist of the President of the Congress, the Chairman of the Committee of Arrangements, the Treasurer of the Congress, the Chairman of the Committee on Scientific Program, and the Secretary of the Committee of Arrangements. After the assembling of the Congress, the Presidency will consist of the foregoing officers and the Vice-Presidents.

COMMITTEE OF ARRANGEMENTS

W J McGee, National Geographic Society, Chairman.

Henry G. Bryant, Geographical Society of Philadelphia.

George B. Shattuck, Geographic Society of Baltimore.

A. Lawrence Rotch, Appalachian Mountain Club, Boston.

Zonia Baber, Geographic Society of Chicago.

George Davidson, Geographical Society of the Pacific, San Francisco.

Frederick W. D'Evelyn, Geographical Society of California, San Francisco.

John Muir, Sierra Club, San Francisco.

Rodney L. Glisan, Mazamas, Portland.

Angelo Heilprin, the American Alpine Club.

Herbert L. Bridgman, Peary Arctic Club.

William M. Davis, Harvard Travellers' Club.

J. H. McCormick, Secretary.

FINANCE COMMITTEE

John Joy Edson, Chairman, President Washington Loan and Trust Company.

Charles J. Bell, President American Security and Trust Company.

David T. Day, United States Geological Survey.

COMMITTEE ON SCIENTIFIC PROGRAM

William M. Davis, Chairman, and Angelo Heilprin, George B. Shattuck, G. K. Gilbert, Henry Gannett, William Libbey, Cyrus C. Adams, and Henry G. Bryant.

COMMITTEE ON TRANSPORTATION

David T. Day, Chairman, and L. W. Busbey, H. L. Bridgman, and Miss Zonia Baber.

COMMITTEE ON BADGES

R. E. Dodge, Chairman, and H. G. Bryant.

COMMITTEE ON PRESS

H. L. Bridgman, Chairman.

COMMITTEE ON PUBLICATIONS

Henry Gannett, Chairman.

THE PHILIPPINE WEATHER SERVICE

THE Philippine Weather Service is one of the most important, if not the most important, of the scientific bureaus of the insular government, not only because of the high character of its scientific work, but also for its practical value to human life and to the industries.

It may be said to have originated in 1865, with the establishment of the Manila Observatory, which was originated and carried on for many years by the Society of Jesus. At the beginning the observatory was equipped with the essential meteorological instruments, and as means were afforded from time to time others were added, until by 1870 it was thoroughly well equipped with instruments.

From the beginning systematic observations were made, and published monthly. It was not, however, until 14 years later, in 1879, that the first practical result was reached in the form of storm warnings. Meanwhile, however, studies had been made of the general meteorologic conditions of the neighborhood of Manila, in the light of the observations made at the observatory, and special study of the typhoon, or baguio, as the concentrated cyclone common in this neighborhood is locally known.

The Philippine Islands are swept by the easterly trade winds from November to May, and from June to October by the southwest monsoon. East of these islands the southwest monsoon of the summer meets the steady easterly trade wind, and here whirls of different velocity and intensity are often set up, which, moving at first westerly with the trades, swing around to the north and northeast as they get well within the region of the southwest monsoon. These are the typhoons so similar to our West Indian hurricanes. The Philippine Islands are directly in their track, and the monsoon season is the typhoon season. It is the prevalence of these storms, so destructive to life and property, that makes a weather service of such exceeding importance.

The course and character of the typhoon of July 7 of the year 1879 were predicted, and much suffering was thereby avoided. The typhoon of November 18 was also predicted, and in consequence of the warning all shipping was held in Manila Bay, resulting in trifling loss, although the typhoon was very severe.

In the three following years fifty-three typhoons were predicted, and in nearly every case the predictions were verified. Upon the completion of the Hongkong-Manila cable, storm warnings were transmitted from Manila to Hongkong, and, as the storms usually occupy two days in transit, ample warning was given to the people of that colony.

In 1884 the meteorological service of the Observatory of Manila was adopted by the Spanish Government by royal order, and was greatly extended by the establishment within the three following years of thirteen secondary stations, all upon the Island of Luzon. All these stations were fully equipped with instruments and connected by telegraph with the central observatory at Manila, to which were wired full meteorological data each day. Besides these second-class stations, fourteen other stations, which may be denominated third-class, were established, principally in the Visayan Islands and in Mindanao, which were not connected by telegraph, and which transmitted their records monthly by mail.

On May 22, 1901, the Philippine Weather Bureau was established by act of the Philippine Commission. It was, in effect, simply the adoption of the former organization, but many extensions and improvements immediately followed. The act provides for a director and three assistant directors for a central observatory; 9 first-class, 25 second-class, 17 third-class, and 20 rain stations, and for observers and instruments to man and equip them.

The rapid extension of the telegraph to all parts of the archipelago made it possible to extend greatly the area covered by stations reporting daily by telegraph, and the usefulness of the service was thus much increased.

The Philippine Weather Service publishes no daily map, but in place thereof furnishes records of the principal meteor data daily to the press and to the officers of the chief ports. Also, when any serious atmospheric disturbance is impending, such as a typhoon, frequent observations are made at all stations even remotely involved, and the port authorities and other local officers of the region concerned are kept closely informed of its movements and character.

It publishes a monthly summary of the weather, much on the plan of our *Monthly Weather Review*, besides numerous miscellaneous publications. It has close relations with the U. S. Weather Bureau and with similar organizations in Europe. Its storm warnings are furnished the principal Chinese and Japanese ports, where they have proved of infinite service to commerce.

The originator of the observatory was Reverend Padre Faura. To him is due its growth and equipment, its establishment as a government institution, and its system of storm warnings. The present director, Reverend Father Algué, needs no introduction, since he is the leading geographer and meteorologist of the Philippine Islands. What his predecessor built he has ably carried out and improved. H. G.

BY order of the Governor of the Philippines, a special committee has been appointed to pass on the spelling of Philippine names. The committee consists of Dr T. H. Parde de Tavera, Philippine Commissioner; the Chief of the Bureau of Coast and Geodetic Survey, the Chief of the Bureau of Ethnological Survey, the Chief of the Bureau of Public Lands, the Director of Posts, and Manuel X. Burgos, and is called the "Philippine Committee of Geographical Names." The committee is to discharge the same duty in respect to Philippine names as has heretofore been discharged by the Board on Geographic Names appointed by President Harrison in 1890. The committee was appointed in accordance with a suggestion of Mr Henry Gannett that the Filipinos would be better able to decide on their own names than the United States Board.

GEOGRAPHIC NOTES

SOME FACTS ABOUT KOREA

THE foreign commerce of Korea amounts to about fifteen millions of dollars, of which two-thirds are exports. It is difficult to learn how much the United States sends Korea, as much of what we send goes by way of China and Japan and is not directly credited to us. In 1903 the value of American exports to Korea, of which there is record, amounted to about $400,000, but it is probable that our actual exports to the country reached double that amount.

The trade of Korea with Japan is growing more rapidly than with any other country, the importation of cotton goods from Japan amounting to from two to three million yen annually (one yen equals 50 cents). Cotton goods are the largest single article in the value of importations into Korea, amounting to between six and seven million yen annually. Silk goods amount to about one and a half million yen per annum. The chief articles of export are rice, 4¼ million yen in value; beans, 2 million yen; hides, 650,000 yen; and ginseng, 527,000 yen.

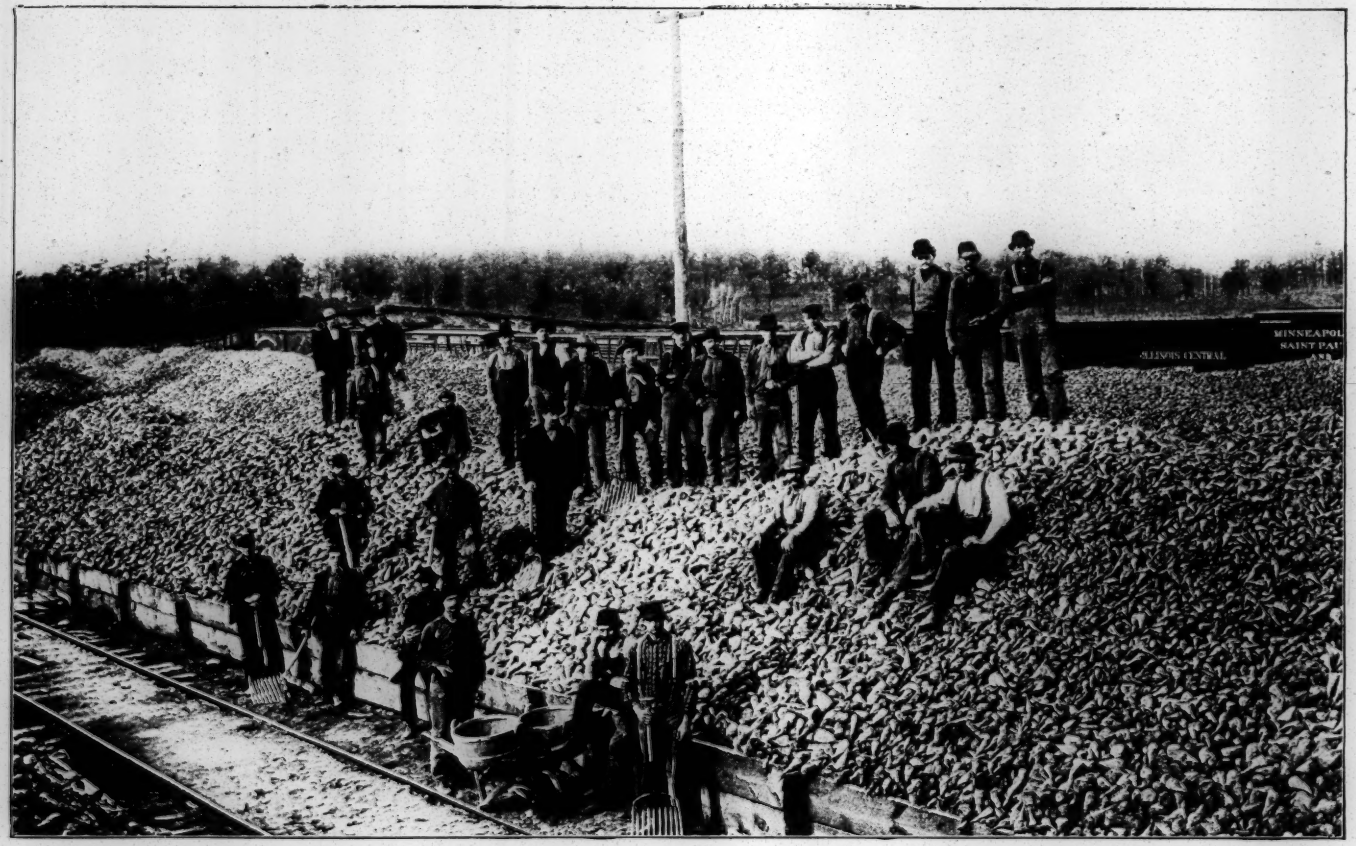
The currency chiefly consists of copper cash and nickel coins, gold and silver coins being out of circulation. The total currency is stated as aggregating about $22,000,000, of which $6,000,000 is copper cash, $14,000,000 nickel, $1,550,000 Japanese coins, and $530,000 Korean silver dollars.

The minerals of Korea are of considerable value. Copper, iron, and coal are reported as abundant, and gold and silver mines are being successfully operated, an American company having charge of and operating a gold mine at the treaty port of Wunsan under a concession granted in 1895. Concessions have also been granted to Russian, German, Japanese, and French subjects.

Railways, telegraphs, telephones, and a postal system have been recently introduced into Korea. A railway from the seaport of Chemulpo to Seoul, the capital, a distance of 26 miles, was built by American contractors, and has reduced the time between the seaport and capital from eight hours to one and three-quarter hours. The Seoul Electric Company, organized chiefly by Americans and with American capital, has built and operated an electric railway near Seoul, which is much used by the natives. This electrical plant is said to be the largest single electrical plant in Asia. The machinery is imported from the United States, and the consulting engineer, a Japanese, is a graduate of the Massachusetts Institute of Technology.

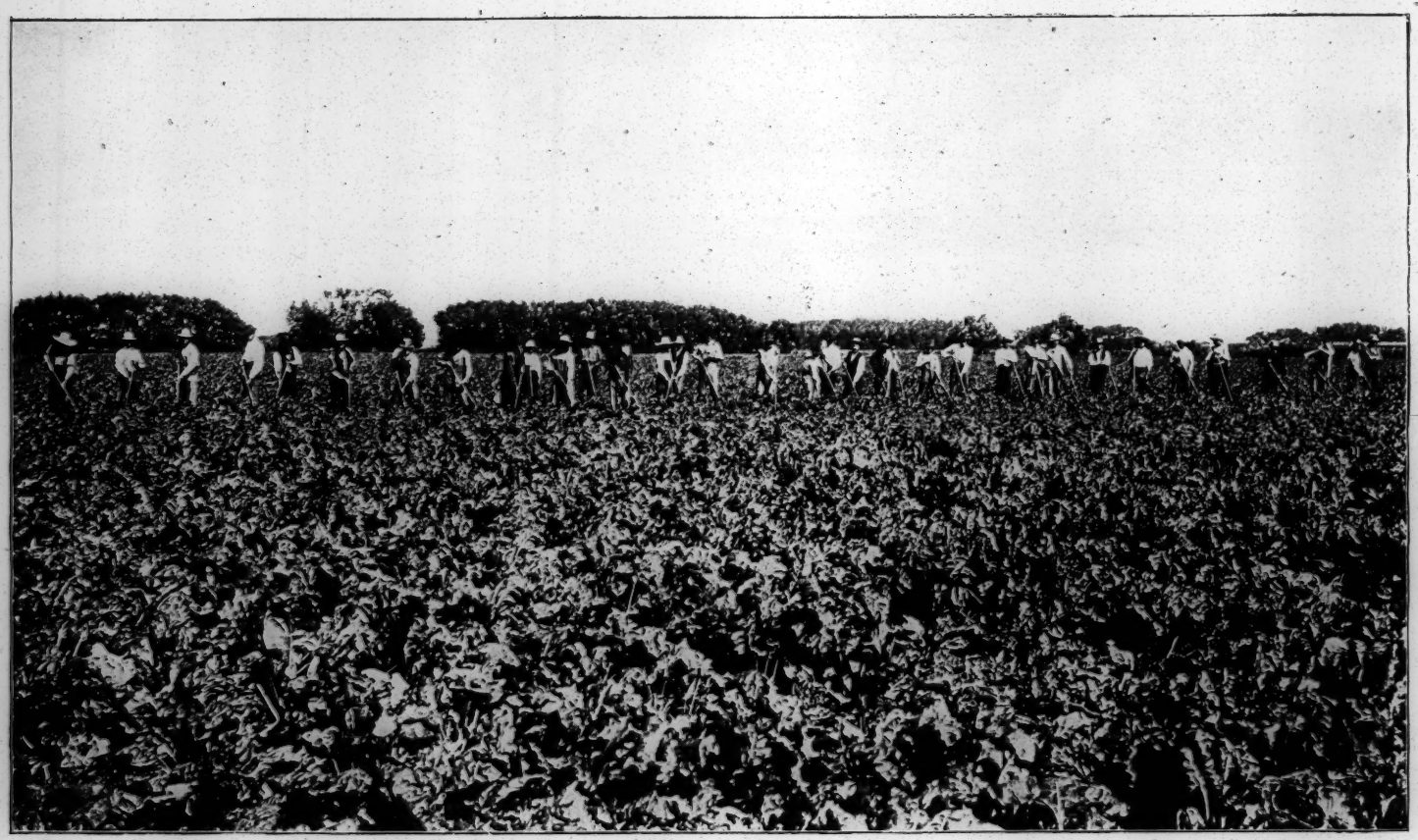
Transportation in the interior is chiefly carried on by porters, pack horses, and oxen, though small river steamers owned by Japanese run on such of the streams as are of sufficient size to justify the use of steamers. The postal system is under French direction and has, in addition to the central bureau at Seoul, 37 postal stations in full operation and 326 substations for registered correspondence.

The area of Korea is estimated at 82,000 square miles, or about equal to that of the State of Kansas. The population is variously estimated at from eight to sixteen millions. The foreign population consists of about 30,000 Japanese, 5,000 Chinese, 300 Americans, 100 British, 100 French, 100 Russians, 50 Germans, and about 50 of various other nationalities.



Pile of Beets by Railroad Track Awaiting Shipment, Minnesota Sugar Company, St. Louis Park, Minn.

Mention has often been made in this Magazine of the many and varied industries which have been created and encouraged in the United States by the Department of Agriculture. One of the most successful of these is the beet-sugar industry. In 1896 the sugar made from beets in this country amounted to 29,220 tons. As a result of the persistent pushing of Secretary Wilson, last year, 1903, it amounted to 260,000 tons, a ninefold increase in seven years.



Hoeing Beets, near Ames, Nebraska

There are many sections of the country where the soil is just what is needed for growing the sweetest and richest beets. Under most favorable conditions, the beet-sugar grower has sometimes netted $100 to $150 an acre. Next to a loose rich soil, the chief requisite is a large number of available laborers, and a sugar factory near at hand. The principal beet-sugar states are California, Michigan, Colorado, Utah, and Nebraska.

Photograph by F. M. Chapman, American Museum of Natural History

An Abandoned Colony of Flamingo Nests, Bahama Islands

Dr Chapman counted 2,000 nests in this colony. Each nest is about 18 inches in diameter and 12 inches high, and is made of mud which the bird scoops up from the bottom. In the bowl at the top of this adobe dwelling the female lays a single white egg. Of the period of incubation, condition of the young at birth, manner of feeding, etc., practically nothing is known. The birds select a new spot for their colony each year. As the site chosen is only a few inches above sea-level, the height of the nests depends on the rise of the water by tides or floods.

IN TRIBUTE TO MARCUS BAKER

THE following resolutions were unanimously adopted by the U. S. Board on Geographic Names at its last meeting :

Whereas death suddenly removed, on Saturday, December 12, 1903, the faithful Secretary of the United States Board on Geographic Names, Mr. MARCUS BAKER, be it resolved :

1. That, realizing keenly the void caused thereby in our Board, we, his colleagues, give this public expression to our warm appreciation of his private character, and of the unflagging interest with which Mr. Baker served this organization almost from the beginning, as Secretary and Editor.

2. We join the scientific men of Washington in deploring the loss of a brilliant mathematician, an efficient officer, a rare organizer, and a man alive with enthusiasm over efforts made for the increase and diffusion of knowledge.

3. We unite with all who knew him in mourning over the death of a good man, a warm friend, a wise counsellor, and a public-spirited citizen.

4. Especially do we sympathize with his devoted wife and family in their sad bereavement of a loving husband and a devoted father. At the same time, we would console them in their dark hour with assurances that our common friend has left behind him fragrant memories of a beautiful and successful life.

The remarkable photograph of flamingo nests on page 82 was taken by Mr F. M. Chapman on a recent trip to the Bahama Islands for the American Museum of Natural History. Only one flock of flamingoes is now known to inhabit the United States, and the nesting grounds of this flock have not yet been discovered, though they are somewhere in the vicinity of Cape Sable, Florida. Formerly the flamingo was quite common on the coasts of Southern United States, but the deep vermilion of its plumage, set off by black wing quills, made it too attractive to the plumage hunter. Dr Chapman brought back several of the nests which are now on exhibition at the American Museum.

"Area, population, commerce, revenue, expenditures, indebtedness, currency, and stocks of money of the principal countries of the world" is the title of a statement just issued by the Department of Commerce and Labor through its Bureau of Statistics. The statement includes all countries and colonies for which statistics of commerce and the other conditions above mentioned are available, and thus presents an approximately complete picture of commercial and financial conditions throughout the entire civilized world.

GEOGRAPHIC LITERATURE

Central Asia and Tibet. By Sven Hedin. With 8 illustrations in color, 16 drawings by distinguished artists, 400 photographs, and 4 maps. In 2 vols. Large 8vo. New York : Chas. Scribner's Sons. 1903. $10 50 *net.*

The public have followed with extraordinary and deserved interest the remarkable explorations of Sven Hedin in Turkestan and Tibet, 1899–1902, and have awaited the publication of his narrative with impatience. The work was hurried through the press, and appeared in two handsome volumes during the last month of 1903, simultaneously in eleven different editions, in eleven widely separated cities, and in nine different languages. It was translated from the Swedish by Mr J. T. Bealby, who several years ago translated

"Through Asia" for Dr Hedin. The translation is admirably done, and reads as smoothly as if originally written in English, while at the same time it preserves the fanciful diction of the author. The English edition of the work is dedicated, with the gratitude and admiration of the author, to Lord Curzon.

It is possible to mention here only a few of Dr Hedin's more notable achievements during the last journey: His navigation of 1500 miles in a ferry-boat down the River Tarim, the greatest inland river of Asia; his discoveries of the remains of populous cities dating from the 3d century A. D., with translations of Chinese manuscripts, there unearthed; his crossing of the mountains of Tibet with the largest and strongest caravan which has ever traversed that country; his extraordinary journey in disguise towards Lhasa; his discovery of Tibetan spies warned of his intention to enter Lhasa; his captivity and escort by 500 Tibetans; his conflicts with them, and his voyage in an English folding boat over twelve Tibetan lakes.

Dr Hedin's descriptions throughout are most graphic which adds immensely to the interest and value of his book. One of the best is his account of a sand storm in the desert.

"It drove right into my face with terrific violence, smothering me with sand and fine reddish-yellow powdery dust. I could not see a single glimpse of the caravan. It was like wading against running water or liquid mud, and despite my most desperate efforts, I was unable to make headway. My previous footprints were entirely obliterated—obscured the instant I lifted my foot. . . .

"The camels knelt in a long row, with their necks stretched out flat on the ground in the direction in which the tempest was blowing. Close to the earth the wind had a velocity of 40½ miles an hour; but on the top of an adjacent mound, only 6 or 7 feet high, it was some 18 miles an hour more, or 58½ miles in all, and I was only able to keep my balance when I knelt. The storm came from the northeast, and its violence enabled me to form some idea of the inconceivable quantities of sand and dust which are transported by this mighty agent towards the regions of the west and southwest. When we stooped down we were well nigh choked by the swirling cloud, which careered along the ground like a cataract, making little eddies of dust as it swept on. Branches, tufts of grass, grains of sand as big as peas were whirled into our faces with stinging force."

When Dr Hedin reached his tent after the storm he found that showers of fine sand had penetrated through the canvas and smothered everything in the interior.

Climbs and Explorations in the Canadian Rockies. By Hugh E. M. Stutfield and J. Norman Collie. With many illustrations and map. Pp. 342. 5½ by 9 inches. New York: Longmans, Green & Co. 1903. $4.00 *net.*

This is an interesting narrative of travels in the mountains of Canada. It truthfully portrays the difficulties of the traveler and climber in reaching his goal when situated at such a distance from the base of supplies. The chapter giving an outline history of the region is interesting in its list of names, ranking with our own pioneers, Lewis and Clarke.

The details of conditions met with are of value to those visiting the region as prospective climbers.

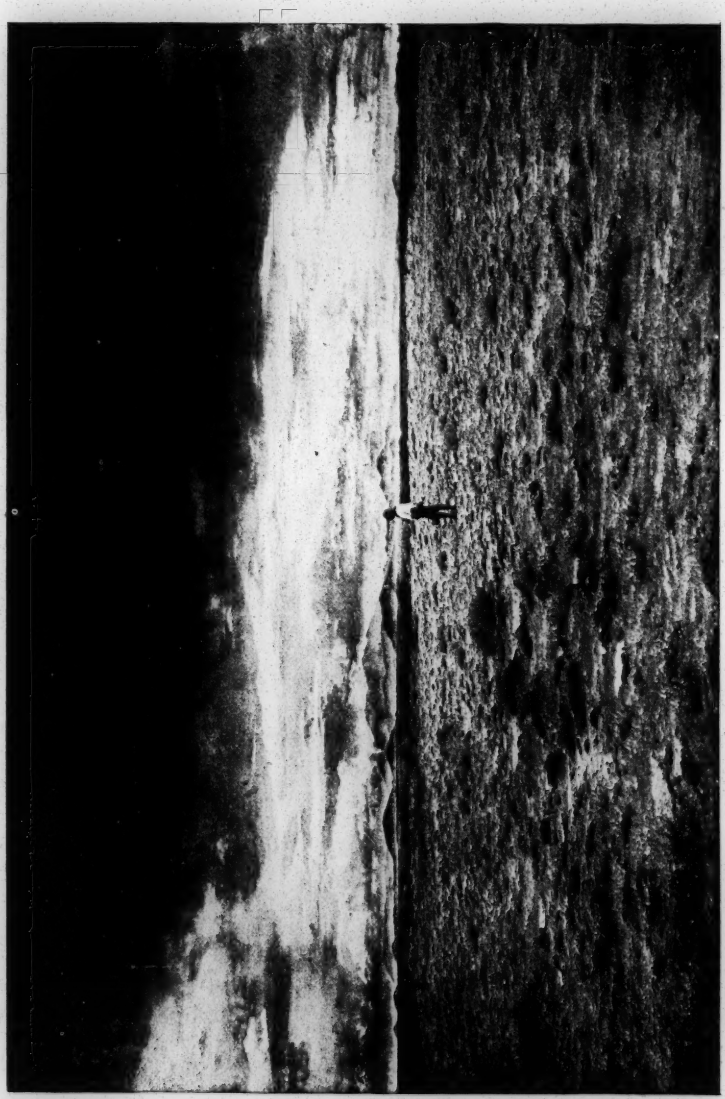
The work done in correcting existing maps is laudable, very few persons on a pleasure outing taking any care of the possibilities in this line.

To one interested in exploratory work there is much that holds him. There is practically no account of the geology of the region. Compared with the Swiss Alps, the authors say the climbs are easier, and

"Last, but by no means least, in the free, wild life of the backwoods can be

From "Central Asia and Tibet," by Dr Sven Hedin. Copyright, 1903, by Charles Scribner's Sons

A Sandstorm in the Desert



From "Indians of the Painted Desert Region," by George Wharton James. Copyright, 1903, by E. E. Farnsworth

In the Heart of the Painted Desert

found absolute freedom from all taint of the vulgar or commonplace; and the sense of mystery and awe at the unknown—things which are gone forever from the high mountain ranges of Europe—yet linger around the crest of the Northern Rockies."

The beautiful illustrations, of which there are a large number, give an excellent idea of the region.

ROBERT H. CHAPMAN.

Geographic Influences in American History. By Albert Perry Brigham. With 73 plates and 16 maps. 5 by 7½ inches. Pp. xiii + 366. Boston: Ginn and Company. 1903.

A story of our history as affected by our environment, charmingly told by a master who knows both aspects of his subject and who understands their relations one to the other. The character of the early immigration to these shores and of the men who formed the vanguard of the westward movements across the continent, the influence of topography, soil, and climate in determining the course of the streams of migration, and the settlement in the great interior valley and the Cordilleran region are sketched out with a bold, free hand in most delightful fashion. It is a fascinating story. H. G.

Indians of the Painted Desert Region. By George Wharton James. Illustrated. Pp. 264. Boston: Little, Brown & Co. 1903.

Mr James gives an exceedingly entertaining, and, on the whole, reliable account of the Hopis, Navahoes, Wallapais, and Havasupais.

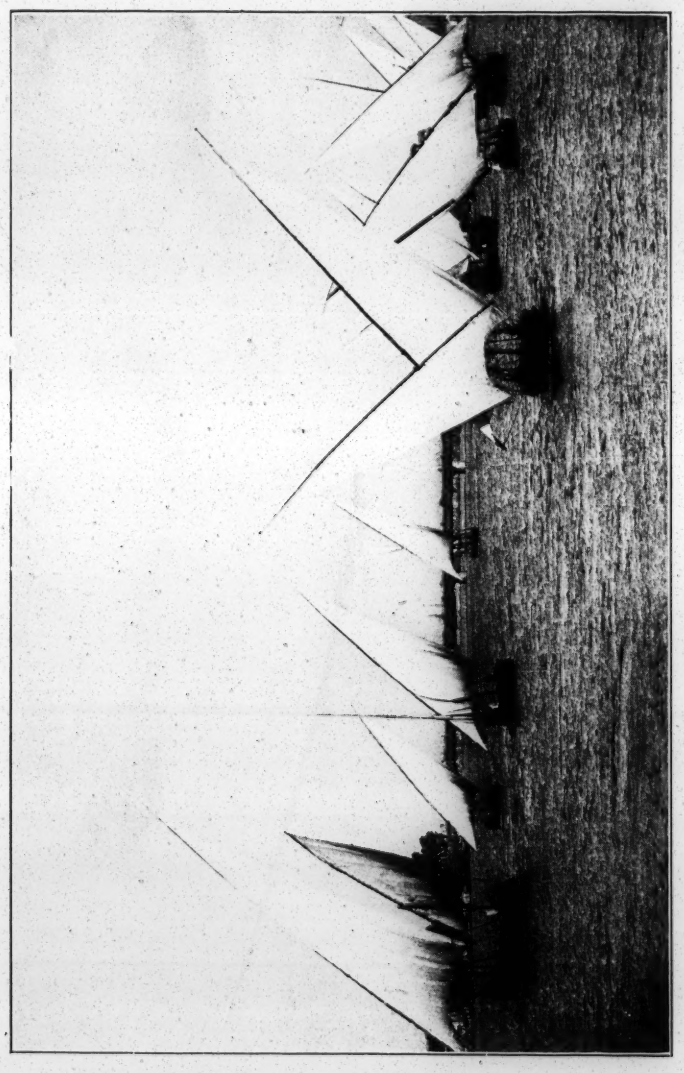
The Hopi houses are owned and built (in the main) by the women; the men weave the women's garments and knit their own stockings. "Here, too, the women enjoy other 'rights' that their white sisters have long fought for. The home life of the Hopis is based upon the rights of women. They own the houses; the wife receives her newly married husband into her home; the children belong to her clan, and have her clan name, and not that of the father; the corn, melons, squash, and other vegetables belong to her when once deposited in her house by the husband. She, indeed, is the queen of her own house; hence the Pueblo Indian woman occupies a social relationship different from that of most aborigines, in that she is on quite equal terms with her husband."

Commercial Geography. A book for high schools, commercial courses, and business colleges. By Jacques W. Redway. With 15 maps and many illustrations. Pp. 406. New York: Charles Scribner's Sons. 1903.

Mr Redway is well known, both as geographer and educator a combination essential in the preparation of good school text books. This book, however, is rather a disappointment, since the treatment of many of the topics is scanty and inadequate and in some cases incorrect. The book may be further characterized as a presentation of facts with little attempt to explain or correlate them. It is a compilation rather than a discussion. H. G.

Present-Day Egypt. By F. C. Penfield. Revised and enlarged edition. Illustrated. Pp. 391. New York: Century Co. 1903.

This volume was first published in 1899. It had already passed through several editions when Mr Penfield decided to revise and enlarge it, so that he might describe the enormous development of Egypt during the past four years. The great dam at Assûan, which forms a lake four times as large as Lake Geneva, and the no less wonderful works at Assiut are probably only the beginnings of a series of reservoirs which will extend at intervals along the Nile perhaps as far as Victoria Nyanza itself. The Assûan dam and the works now in construction will soon increase by 20 per cent the farm



From "Present Day Egypt," by F. C. Penfield. Copyright, 1903, by the Century Co.

On the Nile, above Cairo

land of the country. The water of the Nile is inexhaustible. Each work, however gigantic, soon pays for itself and then yields a handsome revenue each year thereafter. The volume is fascinating from cover to cover.

Meyers Historisch-Geographischer Kalender, 1904. Published by the Bibliographischer Instituts in Leipzig and Wien. New York: Lemcke & Buechner.

This calendar is not only all its title claims for it, but more—it is ethnologic as well. For each day in the year there is a separate detachable page, the upper half of which is devoted to a picture of an historic, geographic, or ethnologic subject, selected with good taste and judgment, many of them being half-tone reproductions of original photographs, one of which is especially noteworthy as a work of art, it being from a photograph by Alexander Alkier. It portrays the reflection of the "midnight sun" on the waters near Spitzbergen. A number of the pictures are reproductions of old historic wood cuts. Beneath the pictures are half a dozen or more lines of explanatory text. The lower half of the page contains a number of references to historic events which occurred on that date; this is followed by the date, the name of the month, day of the week, and the various feast days being also given. Below are the phases of the sun and moon, each month beginning with a planetary table. The work is unique in conception and execution and filled with a mine of information in concise form for the busy worker. J. H. Mc.

Report of the Smithsonian Institution, 1902. Profusely illustrated. Pp. lvi + 687. 6½ by 9 inches. Washington: Government Printing Office. 1903.

In the appendix of this useful annual volume are collected many papers of permanent value, giving a record of scientific progress in different lines. Most of them have been published elsewhere. Two of the papers are reprints of articles from the NATIONAL GEOGRAPHIC MAGAZINE—"Volcanic Eruptions on Martinique and St Vincent," by Prof. Israel C. Russell, and "Reindeer in Alaska," by Gilbert H. Grosvenor. Other articles of geographical nature are: "Progress of Geographical Knowledge," Col. Sir T. H. Holdich; "Wild Tribes of the Malay Peninsula," W. W. Skeat; "Pygmies of the Great Congo Forest," Sir Harry H. Johnston; "Guam and Its People," W. E. Safford; "The Nile Reservoir Dam at Assûan," Thomas H. Means; "Panama Route for a Ship Canal," William H. Burr; "Coral," Dr Louis Roule; "The Baoussé-Roussé Explorations, Study of a New Human Type by M. Verneau," Albert Gaudry.

Geology of Worcester, Mass. By Joseph H. Perry and Benjamin K. Emerson. Illustrated. Pp. xii + 166. 6 by 9 inches. Published by the Worcester Natural History Society. 1903.

This volume will prove a very useful guide to the people of central Massachusetts in their walks and drives. It is to be regretted that similar works do not exist of many other sections of the country.

Early Western Travels. 1748–1846.

The Arthur H. Clark Company, publishers, of Cleveland, Ohio, announce a series of Annotated Reprints of some of the best and rarest contemporary volumes of travel, descriptive of the aborigines and social and economic conditions in the Middle and Far West during the period of early American settlement.

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Almost all of the rare originals are without indexes. In the present reprint series, this immense mass of historical data will be made accessible through one exhaustive analytical index, to occupy the concluding volume.

Irrigation Institutions. By Elwood Mead, C. E., M. S. Illustrated. Pp. xi + 392. —x— inches. New York: The Macmillan Co., 1903. $1.25 net.

The volume discusses the important economic and legal questions created by the growth of irrigated agriculture in the West. It is a timely work. Mr Mead is Chief of Irrigation Investigations of the Department of Agriculture, and for a number of years has had special charge of the examinations of the Department into the social and legal questions created by the use of streams in irrigation, both in this country and in other lands.

The Philippine Islands, 1493–1898.—The Arthur H. Clark Company, Cleveland, announce an important modification in the scope and contents of *The Philippine Islands: 1493–1898*. As originally planned, the series was intended to furnish the original sources, printed and documentary, for the history of the Philippine Islands only to the beginning of the nineteenth century; but so many and urgent requests have come from subscribers and reviewers for such extension of the series as shall cover the entire period of Spanish domination that it has been decided to modify the former plan and bring the work down to 1898.

NATIONAL GEOGRAPHIC SOCIETY.

REGULAR MEETINGS

Cosmos Club, 8 p. m.

February 5.—"The Work of the Bureau of Statistics." Hon. O. P. Austin.

February 12.—"The Work of the Bureau of Fisheries." Dr B. W. Evermann. Illustrated.

March 4.—"The Work of the National Bureau of Standards." Dr G. M. Stratton.

March 18.—"The Work of the U. S. Biological Survey." Dr. C. Hart Merriam

April 1.—"A Trip Through Mindanao." Alonzo H Stewart, Assistant Sergeant of the U. S. Senate. Illustrated.

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National Rifles Armory, 920 G. street.

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Saturday, February 20.—"Joys of the Trail." Mr Hamlin Garland, author and lecturer.

Friday, February 26.—"Travels in Arabia and Along the Persian Gulf." Mr David G. Fairchild, Agricultural Explorer of the Department of Agriculture.

Friday, March 11.—"Little Known Peoples of Mexico." Dr Carl Lumholtz, author of "Unknown Mexico," etc.

Friday, March 25.—"The Louisiana Purchase Exposition." President David R. Francis.

Friday, April 11.—"The Ancient People of Bolivia." Mr Adolph F. Bandelier, American Museum of Natural History.

AFTERNOON COURSE OF LECTURES

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General subject: The Countries of South America. The lectures will be illustrated.

February 27.—Argentine Republic. Charles M. Pepper.

March 5.—Chile.

March 12.—Brazil. Rear Admiral Chapman C. Todd, U. S. N., retired.

March 19.—Peru. His Excellency Manuel Alvarez Calderon, E. E. and M. P from Peru.

March 26.—Colombia and Venezuela. Hon. F. B. Loomis, Assistant Secretary of State.

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